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# SYSTEM AND METHOD FOR SUPPORTING MULTIPLE CALL CENTERS

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CROSS REFERENCE TO RELATED APPLICATION

5 This document claims priority to and the benefit of the filing date of copending provisional application entitled, "SYSTEM AND METHOD FOR PROVIDING SUPPORT TO MULTIPLE CALL CENTERS VIA VOICE AND DATA OVER INTERNET PROTOCOL," assigned Serial Number 60/264242, and filed January 26, 2001, which is hereby incorporated by reference.

10 TECHNICAL FIELD OF THE INVENTION

The invention relates generally to a system that provides, manages, and delivers an open, robust and scaleable platform that is able to support multiple call centers.

15 BACKGROUND OF THE INVENTION

Transmission control protocol (TCP) and internet protocol (IP), together TCP/IP, have become the most widely used network protocols in the computer industry. TCP/IP provides error-free delivery of data and is compatible with most computers and operating systems. In addition to transmitting data packets over TCP/IP, voice over internet protocol (VoIP), also known as internet telephony, or making a telephone call over the internet, is becoming more popular. Its popularity stems from its relatively low cost and ease of installation and maintenance. Business organizations are using VoIP more to answer calls, take requests from customers, and apply target services to customers. VoIP offers the opportunity not only to route a call to a particular call center, but it also

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provides the caller's location information to the call taker. A call center is simply a specific unit of a business organization to which the call is forwarded; call centers may be arranged by geographical location. The particular call center takes the call and provides services to the caller or dispatches a service provider to the caller's location or  
5 location specified by the caller.

An organization, such as a provider of an emergency 911 services, really benefits from having calls forwarded as quickly as possible to the appropriate Public Safety Answering Point (PSAP) call center. In addition, providing that call center with the caller's location information provides usually critical information faster and often more  
10 reliably than requesting it from a caller.

The caller's location is often determined by Automatic Location Information (ALI). ALI information includes the name, address, and other pertinent information (e.g., agencies that serve that address, such as police, fire department, ambulance) about the calling party. Automatic number identification (ANI) is the telephone number of the  
15 calling party. The system that takes the ANI at the call center and interfaces to the ALI database and other external interfaces is often referred to as an ANI/ALI controller. Previous custom has been to have an ANI/ALI controller for each call center.

Although present techniques are capable of providing organizations with information, such as ALI and ANI, about a calling party, improved techniques for  
20 providing such information quicker and at a reduced cost are generally desirable.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 depicts a service providing system in accordance with a preferred embodiment of the present invention.

Figure 2 depicts a more detailed view of the system depicted in Figure 1.

5 Figure 3 depicts a redundant system in accordance with an embodiment of the present invention.

Figure 4 depicts an alternate embodiment of the system depicted in Figure 1.

DETAILED DESCRIPTION OF THE INVENTION

10 A method and system for providing, managing, and delivering a platform that is able to support multiple call centers is described. Figure 1 depicts an exemplary service providing system 10, such as an emergency service providing system, in accordance with a preferred embodiment of the present invention. The system 10 is preferably comprised of a communication network 12 (e.g., the Public Switch Telephone Network or PSTN), a  
15 secure facility 20, a wide area communication network 25 (e.g., TCP/IP network), and call centers 30. The communication network 12 receives calls destined for one of the call centers 30. In this regard, each call destined for one of the call centers 30 is preferably associated with a particular call identifier or a call identifier of a particular set of identifiers. A call identifier associated with an incoming call may be an identifier dialed  
20 or otherwise input by the caller. For example, the call centers 30 may be locations for receiving emergency calls and dispatching emergency service personnel in response to the calls. Such emergency call centers in the prior art are typically identified by a "911"

call identifier that informs communication networks to route the calls to such a call center.

Moreover, when the communication network 12 receives a call having a particular call identifier, such as the "911" identifier, and originating from a calling device located in a particular geographic area, the communication network 12 is preferably configured to route the call to the secure facility 20. In this regard, the secure facility 20 and, hence, the call centers 30 of Figure 1 are preferably utilized for servicing calls only from a particular geographic area or a particular set of geographic areas. Other similar facilities 20 and call centers 30 may be employed to service calls from other geographic areas. Moreover, the network 12 is preferably designed to route calls to the secure facility 20 only if the call originated from an area serviced by the facility 20 and call centers 30.

To determine whether a call originated from the particular geographic area serviced by the facility 20 and call centers 30, the network 12 may analyze the automatic number information (ANI) and/or automatic location information (ALI) associated with the call. In this regard, well known techniques exist for analyzing the ANI and ALI of an incoming call to identify the call as originating from a particular calling device or a particular calling area. Such techniques may be employed by the network 12 to determine whether an incoming call originated from a calling device within an area serviced by the facility 20 and call centers 30. Moreover, if an incoming call originated from such an area and if the incoming call is associated with the particular call identifier referred to above, then the network 12 preferably routes the call to the secure facility 20.

When a call is routed to the secure facility 20, a central data manager 32, which may be implemented in software, hardware, or a combination thereof, processes the call according to techniques that will be described in more detail hereafter and routes the call, over the wide area network 25, to one of the call centers 30 depending on the ANI and/or ALI associated with the call. In processing the call, the central data manager 32 may convert the call from one communication protocol to another communication protocol, such as voice over internet protocol (VoIP), for example, in order to increase the performance and/or efficiency of the system 10. The central data manager 32 may also gather information to help the call centers 30 in processing the call. There are various techniques that may be employed by the central data manager 32 to enhance the performance and/or efficiency of the system 10, and examples of such techniques will be described in more detail hereafter.

Various benefits may be realized by utilizing a central facility 20 to intercept or otherwise receive a call from the network 12 and to then route the call to one of the call centers 30 via WAN 25. For example, serving multiple call centers 30 with a central data manager 32, may help to reduce total equipment costs. In this regard, it is not generally necessary to duplicate the processing performed by the central data manager 32 at each of the call centers 30. Thus, equipment at each of the call centers 30 may be reduced. As more call centers 30 are added, the equipment savings enabled by implementing equipment at the central data manager 32 instead of the call centers 30 generally increases.

Furthermore, the system 10 is not dependent on any telephone company's switch for controlling the manner in which data is communicated to the call centers 30. In this

regard, the central data manager 32 may receive a call from the network 12 and communicate the call to the destination call centers 30 via any desirable communication technique, such as VoIP, for example. Note that enabling VoIP allows voice and data to efficiently travel together over the WAN 25, which is particularly beneficial for emergency service providers.

Data security is another possible benefit of the exemplary system 10 as the central data manager 32 is able to store the data for different network providers associated with network 12 on different partitions. In this regard, the operator of the facility 20 may secure the data utilized by the facility 20 such that a network service provider of the network 12 is unable to access information provided to the secure facility operator by other network service providers. Thus, the network service providers may be more willing to provide the secure facility operator with its information.

Figure 2 is a more detailed view of an exemplary embodiment of the system 10. Other embodiments of the system 10 are possible. The central data manager 32 is comprised of primary and secondary T1 connections 40, voice over IP (VoIP) gateways 45, a Local Area Network (LAN) hub or switch 50, a call manager (soft switch or gatekeeper) 55, a primary server 60 with a local database, a backup server 65 with a local database, and, optionally, a computer-aided dispatch server 70 and a mapping server 75. The call center 30 is comprised of a router 80, LAN hub or switch 85, virtual phone positions or VoIP telephone sets 90, and a local dial tone (DT) switch 95. The term "call center" is used to refer to the organizational unit of a business/office that receives incoming calls as well as, typically, requests for services.

The DMS 100 Tandem office 15 that is depicted in Figure 2 is only representative; it could be any 911 Tandem office or local telephone switch or exchange from which the call originates. The Tandem office 15 is a switch or a group of existing switches that is used for the communication network 12 to determine to which call center 30 calls should be routed. For example, when a person dials 911, he will preferably have dedicated circuits, i.e., 911 trunks, going into a 911 Tandem office. The 911 Tandem office has the responsibility of taking the automatic number identification (ANI) and automatic location information (ALI) from the calling number and determining which Public Safety Answering Point (PSAP) call center that call should be routed to by performing a lookup in the Tandem's database tables and then getting the call switched to that PSAP call center over a dedicated trunk. In the 911 example, the Tandem's database preferably knows not only which PSAP call center serves it, but also which fire department, police department, EMS office, etc., serves that subscriber number. The Tandem 15 contains the database tables that enable it to perform selective routing based on the calling number or ANI. The Tandem 15 passes the information in its database tables on to the central data manager 32 along with the call so that the central data manager 32 knows which call center 30 to transfer the call to. There are multiple dedicated trunks to each call center to provide for redundancy in case one of the trunks fails.

In this particular example, the trunks out of the Tandem office 15 are taken over multiple T1s 40 (for redundancy in case one of the T1s fail) into Voice over Internet Protocol (VoIP) Gateways 45. A T1 is a circuit switch technology circuit that has industry standard signaling.



Note that other types of communication circuits may be utilized in other embodiments. Furthermore, redundant use of communication connections as described herein is desirable but is not a necessary feature of the present invention. The call comes out of the Tandem switch 15 on a specific T1 circuit 40. Each T1 has 24 voice channels and each of those 24 voice channels is dedicated to a specific call center. So, for example, two T1s will have a total of 48 circuits that can be dedicated to 48 call centers. The circuits could serve, for example, 12 call centers with 4 trunks each, for a total of 48 channels, each of which is dedicated to a specific call center. In other words, each trunk or channel is dedicated to a specific call center. The concept is to split those trunks to a specific call center to where half the circuits are on one T1 and the other half are on another T1; or, on a larger system, there will be more than two T1s (but there is always minimum of two T1s for redundancy). So the trunks are split; no more than half of the trunks going to a particular call center will be on one T1, and when a call comes in, the switch knows which call center the call is for.

The VoIP Gateway 45 then converts the T1 circuit switch technology signaling into VoIP signaling. The VoIP Gateway 45 also picks up the ANI and may deliver it to a primary server 60 to make it available for other uses. The VoIP signal then goes through a local area network (LAN) hub or switch 50. That call may then be routed from the LAN hub 50 through a soft switch or gatekeeper or call manager 55, and the call manager 55 then directs that call to a particular call center 30. The central data manager 32 of Figure 2 also includes a router 98. This router 98 takes the VoIP signal and puts it onto a wide area communication network (WAN) or intranet 25 to make the connection to the

appropriate call center 30. There are multiple call centers 30 that are connected to this same network 25.

When the call is presented to a particular call center 30 through a router 80 at the call center 30, the call will ring on a virtual phone or physical VoIP telephone set 90.

5 Figure 2 depicts two Virtual Phones 90, Position 1 and Position 2. Of course, the invention is not limited to two positions; there will be as many positions as are necessary for the particular call center to handle the traffic, and the number of positions in this concept will not vary from traditional call centers. Both ANI/ALI information (i.e., data) and voice are preferably being delivered over the WAN or intranet 25 via the IP protocol  
10 on the same feed. In the embodiment shown by Figure 2, instead of having separate circuits for voice and data, redundant feeds, each of which carry both voice and data (e.g., ANI/ALI) may be used. This redundancy is depicted in Figure 3.

Sub C17 The call will then proceed through the router 80 in the call center 30 into a LAN hub or switch 85 that is capable of handling voice. When the call rings there, the  
15 associated data is also reported back to the central data manager 32 through an IP link into a primary server 60 with local database and/or a secondary, or backup, server 65 with local database. All of this information is delivered over the same WAN or intranet 25 via the call center router 80 to the secure facility router 90 back to the LAN hub 50 in the secure facility into primary server 60 and backup server 65. The data is reported  
20 through either a serial link or an IP packet. The data informs the server(s) 60, 65 that the call on this trunk was presented to this call center 30 and that it has been answered. The software that is running on these servers 60, 65 will then deliver the call screen, which includes the ALI (automatic location information) including the name and the address

Sub C1) and other pertinent information about that calling party, to the call taker at the call center 30. Out of the call center 30, the local Central Office with dial tone 35 is a line going to the central data manager 32 and providing dial tone. This represents administrative lines that allow local phone calls to be made without having to go through a wide area network 5 that could possibly be long distance. In other words, a person could simply press a button on a virtual phone 90 that would get a dial tone out of the central data manager 32.

The servers (both primary 60 and backup 65) have the capability to serve multiple call centers 30 on one or various partitions. Thus, this allows the amount of equipment required by each call center 30 to be reduced, thereby reducing total equipment costs. 10 Instead of having an ANI/ALI controller and a primary and backup server at each call center, multiple call centers 30 (i.e., hundreds) in a plurality of locations may be served by a single central data manager 32 at a central site. Multiple servers are preferably used for redundancy and reliability. Redundant circuits to each call center are still recommended, i.e., two or more high speed (e.g., 56K or higher) circuits. The redundant 15 circuit may be a wireless facility or it could be any means for delivering IP, e.g., a connection over a virtual private network or over the internet or a dial-up link. There are various methodologies for transmitting voice and data to a call center over IP. The redundancy, that is, having at least two circuits to the call center, eliminates individual trunk circuits as well as multiple ALI database circuits to a centralized remote database 20 from each call center. In this case, the redundant circuits will serve as many trunks as desired and the only thing that would change is the bandwidth of the pipes that deliver the IP trunking to the call center.

The equipment for a central data manager 32 may exist at multiple facilities for the sake of redundancy, e.g., the Voice over IP Gateway 45 may be physically located in two different facilities miles apart. Likewise, the primary server 60 and backup server 65 might be in two separate facilities miles apart. So if one of the servers were to be out of service for some reason, the other one could pick up the load and continue on. The server controller, which can be implemented in software, hardware, or a combination thereof, is modular such that different modules may be run on different servers. Furthermore, the workload can be distributed. As the workload increases for a particular controller module, that module can be removed and run on another server that has, for example, more horsepower.

Particular to this invention is the grouping of and interconnectivity between the equipment in the system. The central data manager 32 that houses the primary 60 and backup 65 servers may also house a computer-aided dispatch (CAD) server 70 and a mapping server 75. CAD and mapping are used, for example, when someone dials 911. In order that the caller can be located within a certain amount of accuracy, CAD/mapping draws a map and pinpoints a location on the map. It may also show the nearest police car to that incident or the nearest ambulance or fire station. Computer-aided dispatch allows the 911 service to dispatch that particular fire department or police car or ambulance to the scene. CAD/mapping can show a particular rescue unit's availability and status, and, for example, when a police car is dispatched to the incident, the police car can be dragged and dropped on the screen onto the incident. Often the emergency service has a need to talk to everyone at the incident, but frequently the fire truck, the police car, and the ambulance are all on different radio frequencies. In this situation, CAD/mapping gives

the emergency service a way to click on the incident and, through interfaces, it maintains multiple frequencies on the radio and allows the emergency service personnel to send a simultaneous transmission, rather than having to go through the radio consoles, select all the necessary channels, and then send the message. In other words, the computer  
5 interfaces with the radio equipment and allows a single transmission. The CAD/mapping server(s) 70, 75 will be connected so that CAD/mapping services may be provided to any of the call centers 30 over the same connection. Such "common equipment," such as CAD servers, mapping servers, etc., do not need to be purchased and installed for every single call center that is part of the system. Although some call centers may want their  
10 own CAD/mapping servers, the multiplicity could easily be eliminated and the system could share a common server for these CAD/mapping services. With this system 10 design, servers 60, 65 in centralized points serve multiple call centers 30 rather than each call center having every piece of equipment at its premise.

Also, rather than necessarily having a server 60 on premise at each call center 30,  
15 each call center's information may be placed on a single server 60 in the central controlled environment 20 and simply deliver what a call center 30 needs. For example, when a person logs on to the server 60 for administrative purposes, he will be able to look at the call logs associated with his particular call center 30 without having to look at the call logs for the several other call centers that are sharing the same server 60. Each  
20 call center 30 has its own unique call center identification, unique set of speed dials, unique set of agency associations, and other unique information. Each call center 30 or subscriber may have its own database on the central server 60. For instance, in any given area, information about or directions to get to a particular address, instead of simply the

address, may be helpful. Every call center 30 preferably has the ability to add, modify, and delete its own information. Previously, databases were not set up to have multiple call centers with each call center accessible by only its own employees. Multiple centers would have had to share a single database which may not be feasible for privacy reasons or inter-agency problems or for whatever reason. But the server 60 of the embodiment shown by Figure 2 allows for privacy of information via database partitioning. The partitioned database structure allows multiple independent call centers 30 to be served from a single server 60. This includes user interfaces for entering data for each call center 30, such as supporting agencies, speed dial lists, individual telephone trunk/line interfaces, individual on-premise phone systems as well as reporting software for reporting data to the call center 30.

Normal security and redundancy designs are applicable to this server 60 design. Nothing in the present invention prevents the customary uses of firewalls. Furthermore, if the voice gateways 45 go into two different LAN switches and hubs 50 and those two hubs 50 are tied together with a link, each one also has a connection to either the primary 60 or backup server 65 so that if one hub or switch 50 is lost, the other one is capable of taking the load. In addition, at least two Wide Area Network (WAN) routers 98, 80 may be used on each side for redundancy.

The primary 60 and backup 65 servers have the ability to have local as well as remote databases. For example, a local database can take updates from the telephone company as service orders are processed. If a person moves into a residence and signs up for phone service, if he is a new subscriber in the area, a new record is generated (often called an "insert" record) which contains the subscriber's name, address, telephone

number, and Emergency Service Number (ESN), which is something related to 911 that says this address is served by a particular PSAP call center, fire department, police department, EMS service, etc., so if the subscriber dials 911, all of this information is presented. Then this or any other new, modified, or deleted information would be passed  
5 on to the primary server 60 typically once a day via a download. The central data manager 32 has the ability to store this database locally on site as well as remotely. This provides for flexibility, for example, for the smaller call centers that do not want to spend money on redundant circuits. Instead, the so-called small site would have the information locally and the redundancy would be in that a single link to off-site server(s)  
10 100 would be used if the primary server 60 local database was out of service. In addition, with the redundant server system of the present invention, the changes from the primary server 60 would be updated to the remote servers 100 as well as to the backup server 65. The result is one shared central data manager 32 that may serve various databases for multiple call centers 30.

15 The present invention is not limited to public safety answering point call centers. The method and system of the present invention can be used for any organization or service, for example, for dispatching a truck for package and mail pickup or delivery services, taxi or limousine services, food delivery services, plumbing services, floral delivery, etc. It is ideal for, but not limited to, any type of fleet management system,  
20 pickup/delivery services, or time-critical service provided at a residential or commercial location. The present invention can be used for receiving and collecting information from a call and then routing the call to the nearest branch office, central office, etc. Any kind of services-oriented business can benefit from the system of the present invention in

order to take calls as well as to share a phone system, instead of having a key system and/or private branch exchange (PBX) for each different site. Sharing a common Voice over IP system is a major advantage of the present invention, but in addition, these other products, such as mapping, ALI, and computer-aided dispatch, are beneficial in industries  
5 other than public safety and emergency 911 services.

Rather than having to dispatch maintenance people to do upgrades, the server 60 may be maintained with the latest software upgrades at the server level. In addition, training on the usage of the server 60 is offered out of a centralized place, in addition to web-based training over the closed circuit. The server 60 also has the capability to  
10 support multiple remote printers, CAD interfaces, remote databases, and telephone systems from a central site 20.

Having the tandem office 15 is not a necessary feature of the system 10 of this invention. In an alternate embodiment as depicted in Figure 4, the Tandem office 15 is eliminated and replaced, for example, with an SS7 network 110. In this embodiment, the  
15 primary 60 and/or backup 65 servers provide the database lookups and call routing to the appropriate call center 30 based on the ANI/ALI of the calling number. In this embodiment, all of the calls are routed from the SS7 network 110 to the central data manager 32. Connections to the VoIP gateways 45 still exist, but instead of using T1 links 40, the alternate embodiment may use SS7 signaling links 120 to connect the  
20 existing SS7 network 110 to the VoIP gateways 45 via an SS7 signaling interface 125. SS7 signaling links 120 are also used to connect the end offices 130 to the SS7 network 110. The end offices 130 have separate voice circuits 140 to the VoIP gateways 45. The Public Switch Telephone Network (PSTN) 12 has multiple types of trunks. SS7 is a type



of connection that sends signaling separate from the voice type of signaling **140**; for example, it sends the automatic number identification (ANI) and other information over the signaling link channel **120** separate from the voice signal **140**. The SS7 network **110** has a connection into every end office **130** that serves a particular geographical area, whether through local dial tone connection, wireless connection, internet service provider, etc. The SS7 signaling links **120** are simply a way to get the calls from each of these end offices **130** on the SS7 network **110** to the servers **60**, **65**. In addition, the SS7 signaling links **120** provide the ANI and other information to the server **60** so that the server **60** can then process the call to the appropriate call center **30**. By using the SS7 network **110** and signaling links **120** (via the SS7 signaling interface **125**, VoIP gateways **45**, and LAN hub **50**), the speed of the call is increased because channel associated signaling with multiple frequencies, which is slower and older technology, is not used. The SS7-delivered information is taken directly and converted to IP. Eliminating channel associated signaling as well as the Tandem is much faster. As soon as the call is received by the server **60**, it is immediately dispatched to a phone which rings at the call center **30**; an approximate five-to-six second delay is eliminated.